



Bridge Engineering and NHPA

**We're Golden:
Celebrating 50 Years of the National Historic
Preservation Act**

October 28th, 2016

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Presentation Outline

- Introduction
- Project Development Process
- Inspection
- Analysis
- Consultation/Public Presentation
- Construction
- Summary

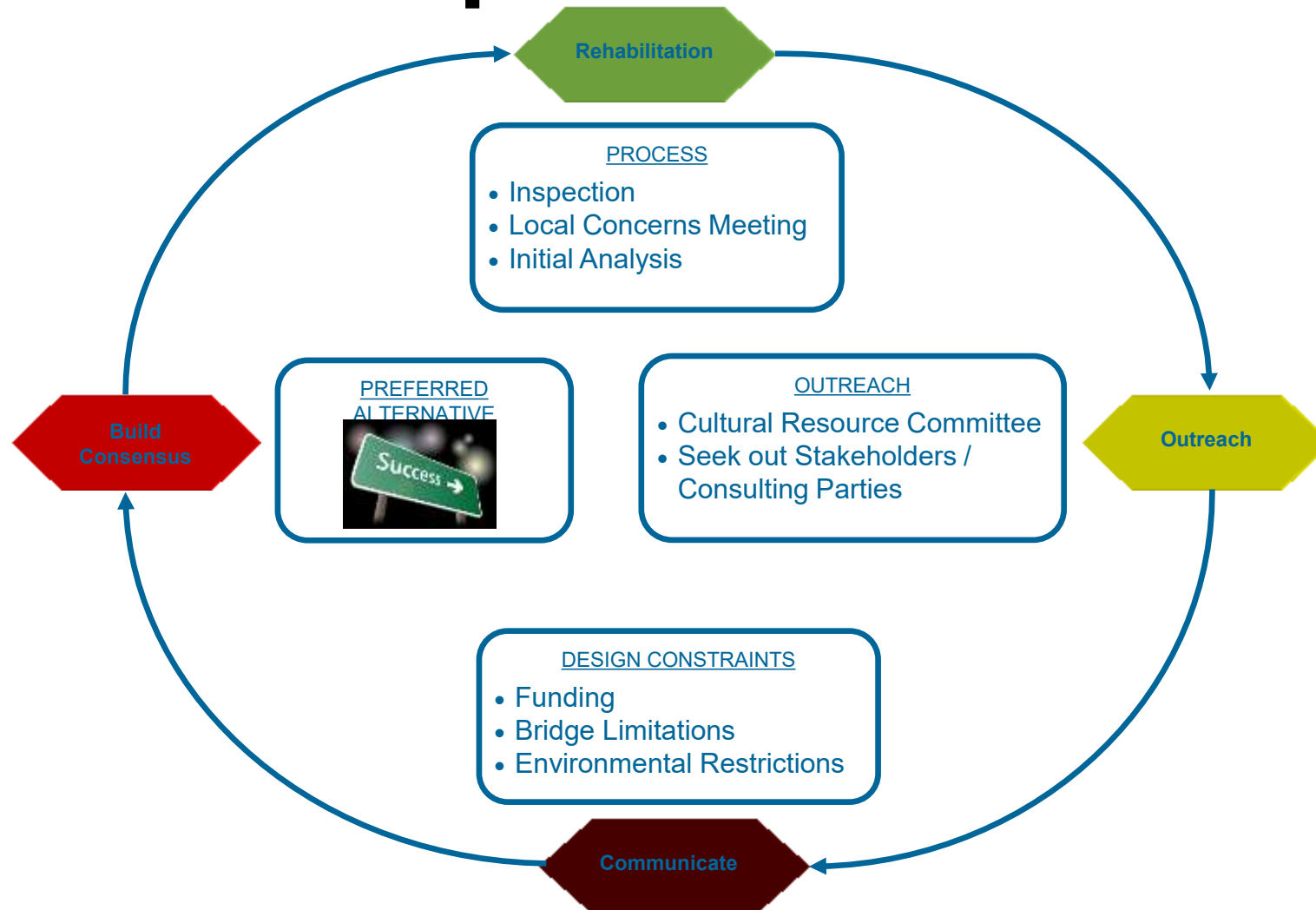
Introduction

- Engineer's Perspective
 - Educated to Solve Problems
 - Heavy Use of Math and Science
 - Typically No Preservation Coursework in Engineering Programs
 - Protect Safety, Health and Welfare of Public

Introduction

- Historic Bridge Projects
 - Ramsdell Road Bridge, Henniker, NH
 - Union Street Bridge, Peterborough, NH
 - Blair Covered Bridge, Campton, NH

Project Development Process



Inspection

- National Bridge Inspection Standards (NBIS)
 - Developed in 1971 in Response to Silver Bridge Collapse
 - Establish Inspection Procedures/Frequency/Qualifications, etc.
- Special Inspections
 - Scheduled to Monitor a Known Deficiency
 - Rehabilitative Measures

Inspection Ladders



Western Avenue Bridge



Blair Covered Bridge

Inspection

Scaffolding/Staging



Bath Village Covered Bridge



Bath Village Covered Bridge

Inspection

Scaffolding/Staging



Piscataquog Trestle



Piscataquog Trestle

Inspection

Aerial Lift



I-95 High Level Bridge



I-95 High Level Bridge

Inspection

Underbridge Inspection Vehicles



Piermont/Bradford



Lancaster

Inspection Bucket Trucks



Lancaster



Lateral Bracing



Top Chord

Inspection Bridge Tracker



Western Avenue Bridge



Top Chord



Gusset Plate

Inspection

Rope Access



Augusta Memorial Bridge

Inspection

Rope Access

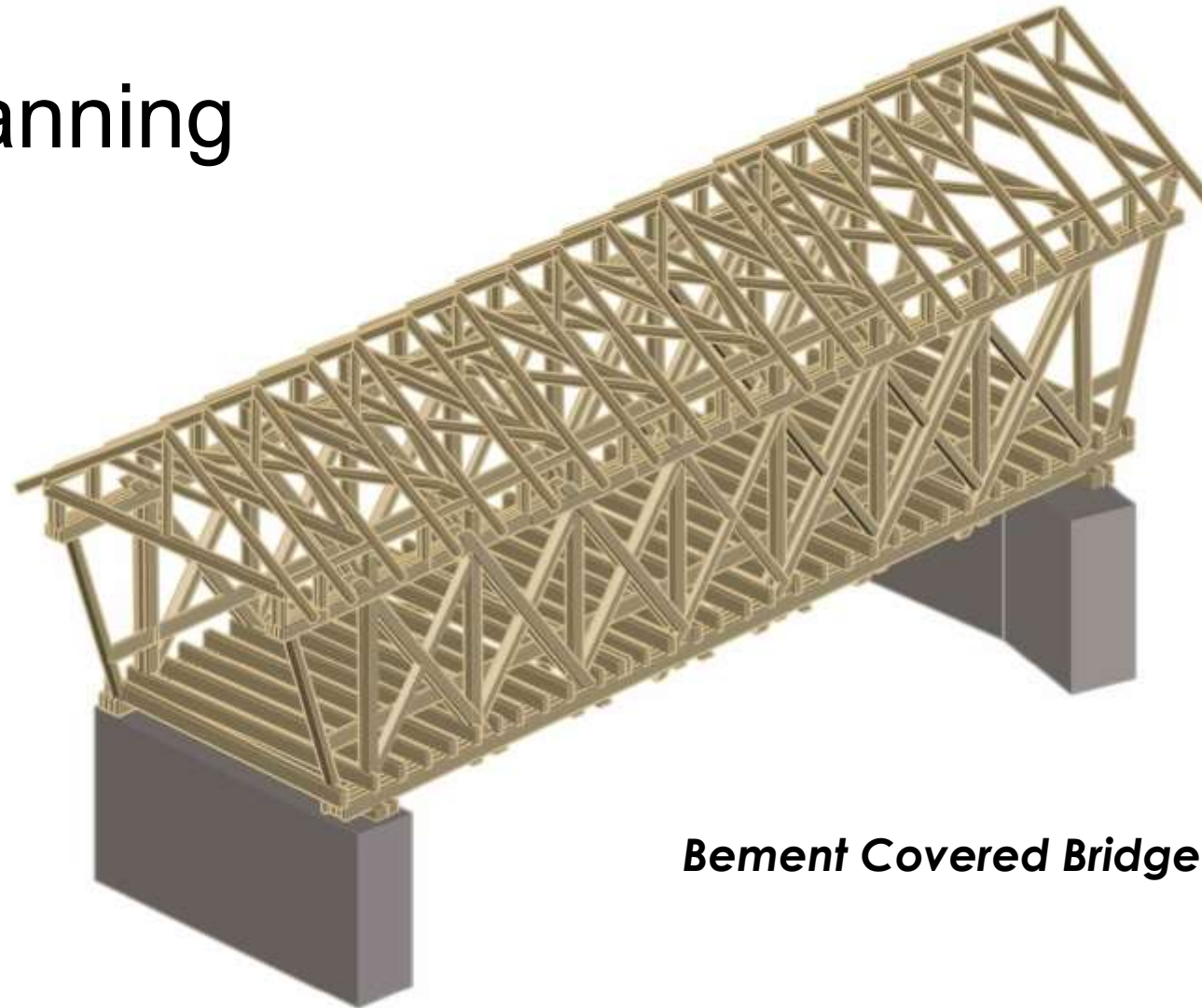


Augusta Memorial Bridge



Inspection

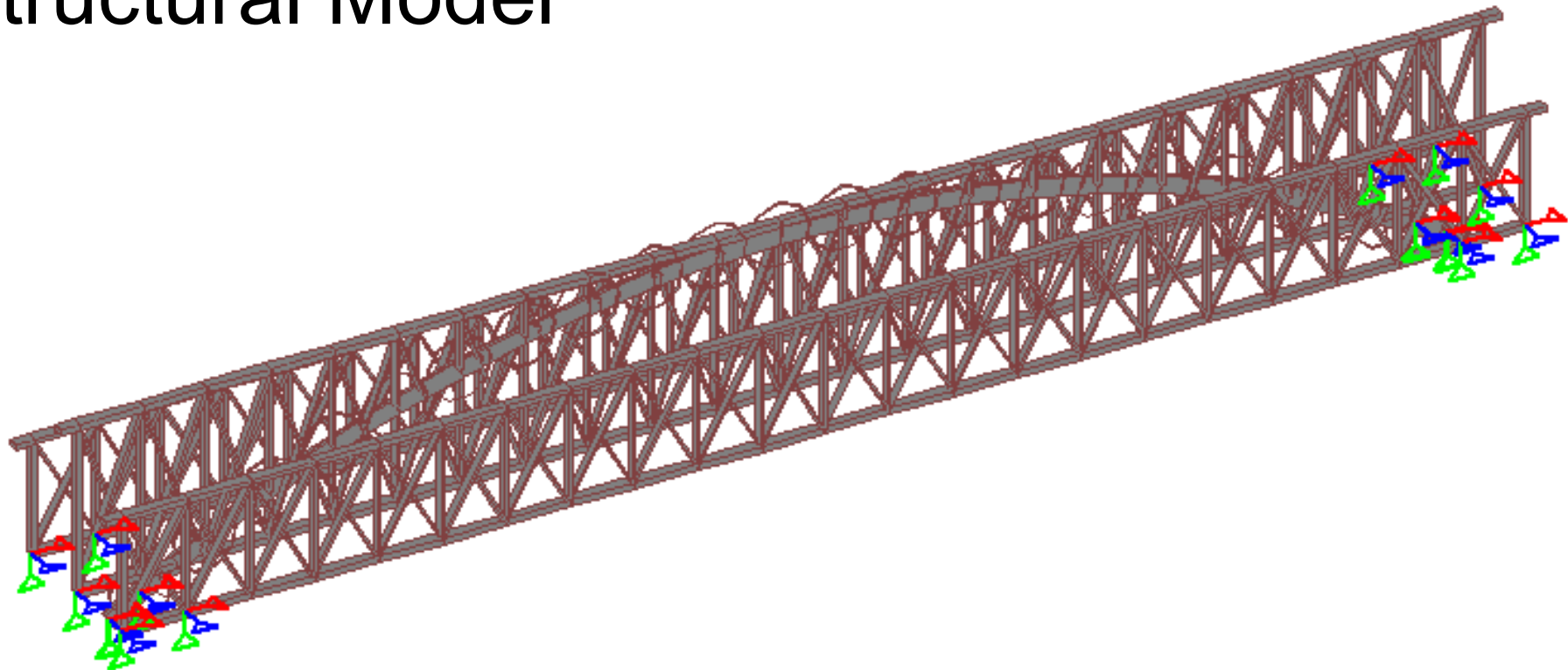
3D Laser Scanning



Cement Covered Bridge

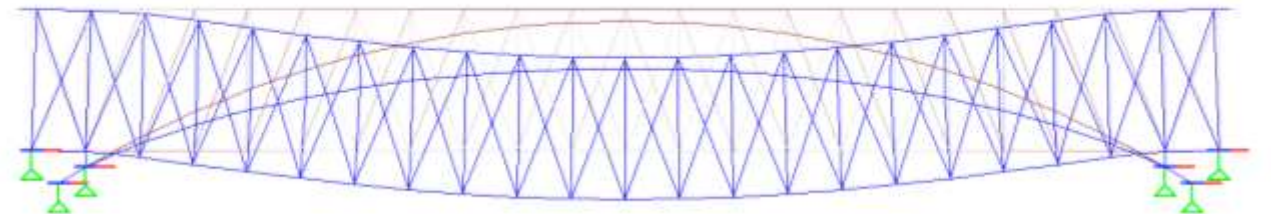
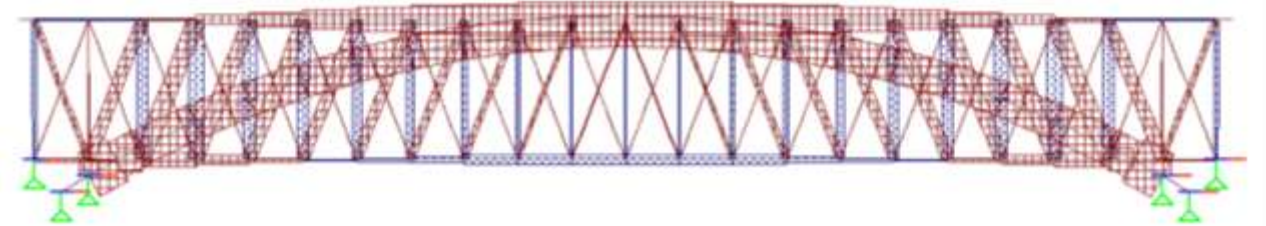
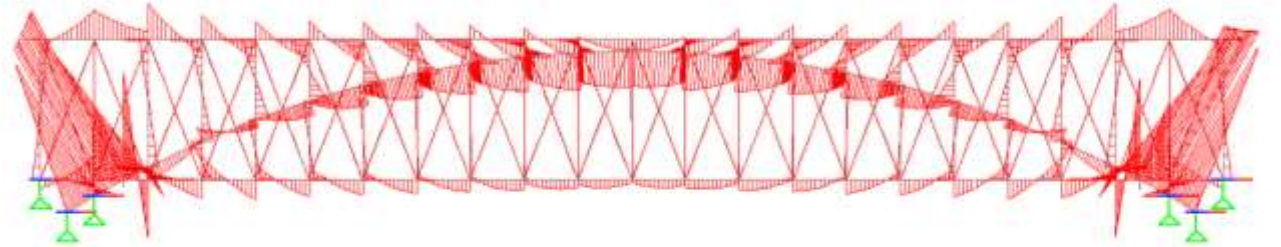
Analysis

3D Structural Model



Analysis

- Applied Moments
- Applied Axial Forces
- Deflected Shape



Consultation/Public Presentation

- Local Concerns Meeting
- Public Information Meetings
- Abutter Notification Letters
- Input from Public
- Address Public Concerns

Consultation/Public Presentation

- Initial Cultural Resources Agency (CRA) Meeting
- Project Review and Input
- Revise/Improve Design
- Follow up CRA Meeting
- Continue Consultation During Construction



On-Site Meeting

Consultation/Public Presentation

- Goals
 - Avoid or Minimize Adverse Affect to Historic Properties
 - Engage Stakeholders/Public
 - Avoid Project Delays
 - Successful Completion of Project

Construction

- Ramsdell Road Bridge – Project Background
 - 108'-0" Long Warren Truss
 - Constructed in 1937
 - One of 7 Warren Trusses Remaining in New Hampshire – One is Bypassed
 - Town Goals
 - Preserve Bridge if Practical and Cost Effective
 - Increase Live Load Capacity



Construction

Ramsdell Road Bridge



***Bottom Chord and Gusset Plate Section
Loss (Hidden by Floor Framing)***



***New Interior Gusset Plate
Installed***

Construction

Ramsdell Road Bridge



Concrete Removal at Southeast Wingwall



New Floor System Framing Being Installed

Construction

Ramsdell Road Bridge



South Truss Bottom Chord Removal



New Bottom Chord Installation (South Truss)

Construction

- Union Street Bridge – Project Background
 - 73' Long Concrete Rigid Frame with Stone Parapet Walls
 - Built in 1937
 - Town Goals
 - Preserve Bridge and Stone Parapet Walls
 - Increase Live Load Capacity



Construction

Union Street Bridge



Upstream Parapet Wall



Downstream Parapet Wall

Construction

Union Street Bridge



Removing Capstones



Removing Parapet Wall

Construction

Union Street Bridge



Removing Stone Masonry



Removing Arch Stones



Reinstalling Stone Masonry

Construction

Union Street Bridge



Before



After

Construction

- Blair Covered Bridge – Project Background
 - 299'-6" (End to End of Portals) Long Truss
 - Built in 1870
 - One of Four Long Truss Covered Bridges in NH
 - Town Goals
 - Preserve Bridge
 - Increase Live Load Capacity to 6 Tons



Construction

Blair Covered Bridge



Before



After

Construction

Blair Covered Bridge



Removing Existing Bolts



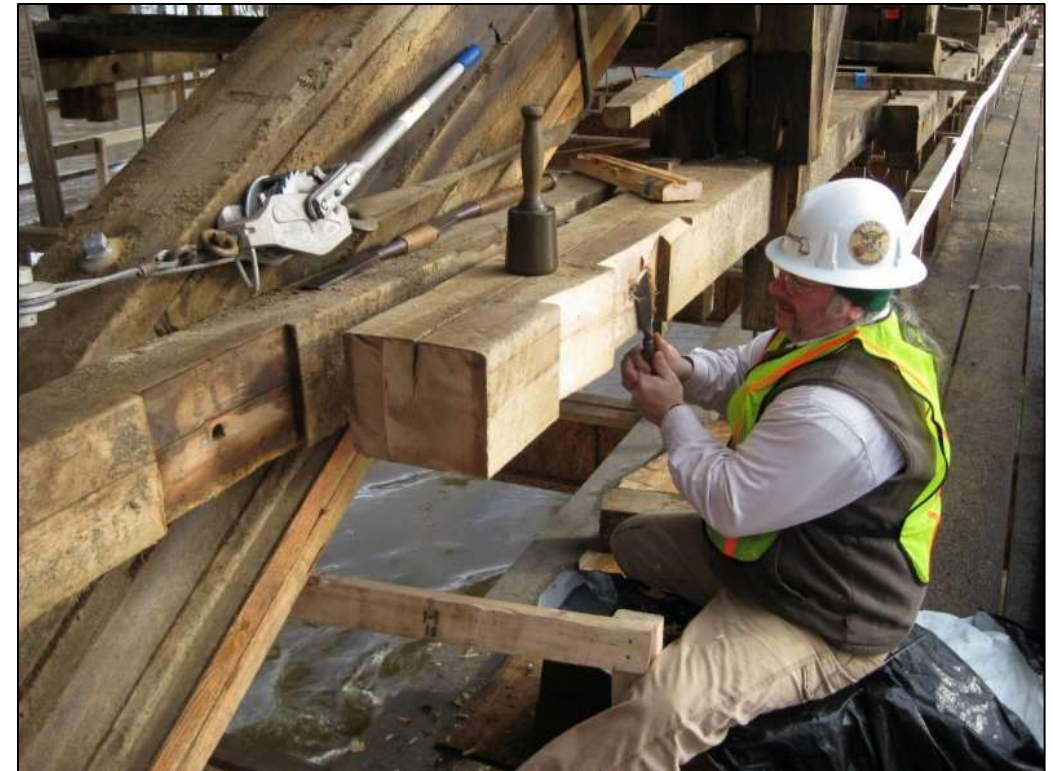
Salvaged Bolts

Construction

Blair Covered Bridge



Tools



Cutting New Joints

Construction

Blair Covered Bridge



New Splice Blocks



Cutting Mortise in Cross Beam



Spliced Cross Beam

Construction

Blair Covered Bridge



New Vertical



Spliced Vertical



Repaired Cross Beam

Summary

- Engineer's Have a Unique Project View
- Inspection / Analysis is a Key Part of Process
- Close Coordination with Stakeholders Through all Project Phases
- Historic Structures can be Successfully Rehabilitated
- Key to Successful Preservation = Maintenance

Conclusion

Henniker's Bridge Washing Program

